CLAIMS

1. An apparatus comprising:

a substrate including a plurality of conducting layers; and

a nanocomposite inter-layer dielectric (ILD) sandwiched between the conducting layers, wherein the nanocomposite ILD layer comprises a nanocomposite including a polymer having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio.

2. The apparatus of claim 1 wherein the nanoclay particles have an aspect ratio greater than about 50.

3. The apparatus of claim 1 wherein the nanoclay particles have an aspect ratio greater than about 200.

4. The apparatus of claim 1 wherein the nanoclay particles are platelets or tactoids.

5. The apparatus of claim 1 wherein the nanocomposite comprises less than 25 percent by weight of nanoclay particles.

6. The apparatus of claim 5 wherein the nanocomposite comprises less than 10 percent by weight of nanoclay particles.

7. The apparatus of claim 6 wherein the nanocomposite comprises less than 5 percent by weight of nanoclay particles.

8. The apparatus of claim 7 wherein the nanocomposite comprises less than ½ percent by weight of nanoclay particles.

9. The apparatus of claim 1 wherein the nanoclay comprises natural clays, synthetic clays, modified phyllosilicates, or combinations or blends thereof.

10. The apparatus of claim 1 wherein the polymer binder comprises a thermally curable polymer.

11. An apparatus comprising:

a substrate having a contact surface; and

a nanocomposite solder resist layer placed on the contact surface, wherein the solder resist comprises a nanocomposite including a polymer binder having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio.

12. The apparatus of claim 11 wherein the nanoclay particles have an aspect ratio greater than about 50.

13. The apparatus of claim 11 wherein the nanoclay particles have an aspect ratio greater than about 200.

14. The apparatus of claim 11 wherein the nanoclay particles are platelets or tactoids.

15. The apparatus of claim 11 wherein the nanocomposite comprises less than 25 percent by weight of nanoclay particles.

16. The apparatus of claim 15 wherein the nanocomposite comprises less than 10 percent by weight of nanoclay particles.

17. The apparatus of claim 16 wherein the nanocomposite comprises less than 5 percent by weight of nanoclay particles.

18. The apparatus of claim 17 wherein the nanocomposite comprises less than ½ percent by weight of nanoclay particles.

19. The apparatus of claim 11 wherein the nanoclay comprises natural clays, synthetic clays, modified phyllosilicates, or combinations or blends thereof.

20. The apparatus of claim 11 wherein the polymer binder comprises a thermally curable polymer.

21. The apparatus of claim 11 wherein the polymer binder comprises a photo-curable polymer.

22. The apparatus of claim 11 wherein the substrate comprises:

a plurality of conducting layers; and

a nanocomposite inter-layer dielectric (ILD) sandwiched between the conducting layers, wherein the nanocomposite ILD layer includes a nanocomposite comprising a polymer binder having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio.

23. A system comprising:

a substrate having a contact surface;

a nanocomposite solder resist layer placed on the contact surface, wherein the solder resist comprises a nanocomposite including a polymer binder having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio; and

a die attached to and in electrical contact with the contact surface, the die being attached using solder deposited in holes in the nanocomposite solder resist layer.

24. The apparatus of claim 23 wherein the nanoclay particles have an aspect ratio greater than about 50.

25. The apparatus of claim 23 wherein the nanoclay particles have an aspect ratio greater than about 200.

26. The apparatus of claim 23 wherein the nanoclay particles are platelets or tactoids.

27. The apparatus of claim 23 wherein the nanocomposite comprises less than 25 percent by weight of nanoclay particles.

28. The apparatus of claim 27 wherein the nanocomposite comprises less than 10 percent by weight of nanoclay particles.

29. The apparatus of claim 28 wherein the nanocomposite comprises less than 5 percent by weight of nanoclay particles.

30. The apparatus of claim 29 wherein the nanocomposite comprises less than ½ percent by weight of nanoclay particles.

31. The apparatus of claim 23 wherein the nanoclay comprises natural clays, synthetic clays, modified phyllosilicates, or combinations or blends thereof.

32. The apparatus of claim 23 wherein the polymer binder comprises a thermally curable polymer.

33. The apparatus of claim 23 wherein the polymer binder comprises a photo-curable polymer.

34. The apparatus of claim 23 wherein the substrate comprises:

a plurality of conducting layers; and

a nanocomposite inter-layer dielectric (ILD) sandwiched between the conducting layers, wherein the nanocomposite ILD layer includes a nanocomposite comprising a polymer binder having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio.

35. A process comprising:

providing a plurality of conducting layers; and

sandwiching a nanocomposite inter-layer dielectric (ILD) between the conducting layers, wherein the nanocomposite ILD layer comprises a nanocomposite including a polymer binder having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio.

36. The process of claim 35 wherein the nanoclay particles have an aspect ratio greater than about 50.

37. The process of claim 35 wherein the nanoclay particles have an aspect ratio greater than about 200.

38. The process of claim 35 wherein the nanoclay particles are platelets or tactoids.

39. The process of claim 35 wherein the nanocomposite comprises less than 25 percent by weight of nanoclay particles.

40. The process of claim 39 wherein the nanocomposite comprises less than 10 percent by weight of nanoclay particles.

41. The process of claim 40 wherein the nanocomposite comprises less than 5 percent by weight of nanoclay particles.

42. The process of claim 41 wherein the nanocomposite comprises less than ½ percent by weight of nanoclay particles.

43. The process of claim 35 wherein the nanoclay comprises natural clays, synthetic clays, modified phyllosilicates, or combinations or blends thereof.

44. The process of claim 35 wherein the polymer binder comprises a thermally curable polymer.

45. A process comprising:

providing a substrate having a contact surface;

placing a nanocomposite solder resist layer the contact surface, wherein the solder resist comprises a nanocomposite including a polymer binder having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio; and

attaching a die to the substrate such that it is in electrical contact with the contact surface, the die being attached using solder deposited in holes in the nanocomposite solder resist layer.

46. The process of claim 45 wherein the nanoclay particles have an aspect ratio greater than about 50.

47. The process of claim 45 wherein the nanoclay particles have an aspect ratio greater than about 200.

48. The process of claim 45 wherein the nanoclay particles are platelets or tactoids.

49. The process of claim 45 wherein the nanocomposite comprises less than 25 percent by weight of nanoclay particles.

50. The process of claim 49 wherein the nanocomposite comprises less than 10 percent by weight of nanoclay particles.

51. The process of claim 50 wherein the nanocomposite comprises less than 5 percent by weight of nanoclay particles.

52. The process of claim 51 wherein the nanocomposite comprises less than ½ percent by weight of nanoclay particles.

53. The process of claim 45 wherein the nanoclay comprises natural clays, synthetic clays, modified phyllosilicates, or combinations or blends thereof.

54. The process of claim 45 wherein the polymer binder comprises a thermally curable polymer.

55. The process of claim 45 wherein the polymer binder comprises a photo-curable polymer.

56. The process of claim 45 wherein the substrate comprises:

a plurality of conducting layers; and

a nanocomposite inter-layer dielectric (ILD) sandwiched between the conducting layers, wherein the nanocomposite ILD layer includes a nanocomposite comprising a polymer binder having a plurality of nanoclay particles dispersed therein, the nanoclay particles having a high aspect ratio.